

## LETTERS TO THE EDITOR.

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### Reconstruction of *Diprotodon* from the Callabonna Deposits, South Australia.

SOME years ago, under dates June 21 and June 28, 1894, NATURE contained a notice of an extensive deposit, at Lake Callabonna, South Australia, of fossil bones of *Diprotodon*, *Phascolonus*, various species of extinct kangaroos, and of a large struthious bird, since named *Genyornis newtoni*, in honour of the late lamented Prof. Newton, of Cambridge, and in recognition of much personal kindness received from him by the writer. Since that date various and more detailed references to some of the forms represented in this deposit have appeared in the Transactions and Memoirs of the Royal Society of South Australia; and now, at last, after a lapse of years, which may have seemed unnecessarily long to those unacquainted with all the circumstances of the case, we have lately completed at this museum a complete cast in plaster of the skeleton of *Diprotodon australis*. Some of your readers may be interested in the photograph of this cast which I now send you (Fig. 1), as well as in one which gives our idea of the reconstruction in the flesh of this marsupial (Fig. 2).

As has been previously mentioned in your columns and in the other publication referred to, the state in which the Callabonna fossils were originally found, and the injury which they suffered as the result of a long journey on camel back to the railway line, were such as to require the expenditure upon them of much detailed preparatory labour before they could be restored to a sound and enduring condition; but while the ultimate result has been quite satisfactory as regards the appendicular skeleton, there have been much greater difficulties, and not so completely a satisfactory result, in respect to the skull and vertebral column. In both these categories the bones were to a degree above all the others soft, friable, broken, and infiltrated with saline matter that was difficult to remove. In the skulls particularly, the constituent bones were both broken and greatly distorted. Those that had been found lying on their sides were laterally compressed to an extent that the whole cranial mass formed a flattened slab which in some instances did not exceed a few inches in thickness. In other cases the compression had occurred in a dorso-ventral direction with a like result of producing many fractures and much distortion of the proper relation of parts. Fortunately, the distortion has not affected every skull in the same way, so that in the construction of the cast it has been possible to utilise undisturbed parts of different skulls.

Nevertheless, even with the considerable mass of material available, both from Callabonna and from other localities, there were some parts of the skull which were never found in an intact condition, and it is in these respects that the cast is not to our satisfaction.

For the information of those who will, it is hoped, eventually possess a copy of this cast, it may be well now to mention those parts the correctness of which we cannot, unfortunately, for the above reasons guarantee. Coming under this category are the occipital region, with the exception of the condyles and the immediate boundaries of the neural foramen. In not a single skull from Callabonna or from elsewhere was this extensive region without such serious breakage and distortion as to render a

faithful reproduction of its details impossible. Consequently, in our restoration we have followed as best we could the details of Owen's figure (Owen's "Fossil Mammals of Australia," Plate xix., Fig. 3). Then another part that was always greatly damaged was the anterior or malar pier of the zygomatic arch, the broken parts being generally telescoped; thus we are not quite satisfied that we have got this region as it should be, though in other respects the zygoma is correct. Also, as might be expected, the thin laminar edges of the lateral boundaries of the mesopterygoid fossa were always broken, so that we have been consequently devoid of objective guidance in their reconstruction.

For the vertebræ, many of which were also in a particularly fragmentary and friable condition, a set belonging to one animal which was numerically nearly complete was used as models. Where parts of these were deficient, as often occurred, they could generally be supplied by the corresponding segment from another animal, but not always so. We had no model for the neural spines of the sixth and seventh cervical vertebræ, which are thus parts added in conformity with what we conceive to be the serial plan of arrangement. Fourteen vertebræ bear ribs, and there are five of the lumbar series; four are fused to form the sacral mass, and there are nineteen separate

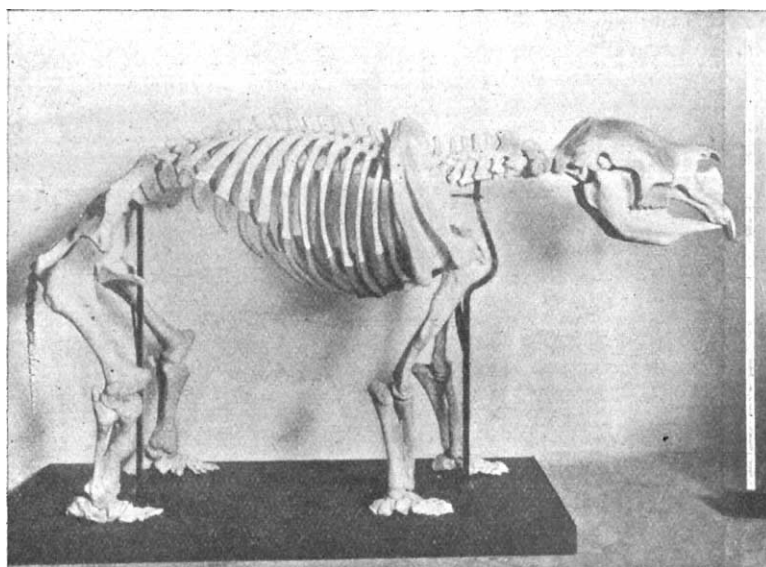


FIG. 1.—Plaster cast of the skeleton of *Diprotodon australis*.

segments in the tail. The ribs, with one exception, are those belonging to the vertebræ, but as most of them were considerably twisted or otherwise distorted, it was sometimes necessary that they should undergo the operation known to wheelwrights as "cutting and shutting" before they could be set properly both to their respective vertebræ and to one another.

As previously stated, the limb bones, from their fewer fractures and better texture, gave much less trouble in their restoration than those of the axial skeleton. Most of them belong to the same individual as the vertebræ, but some, in a damaged condition, have been replaced by other bones of suitable size. The peculiar feet, the structure of which was revealed by the Callabonna discovery, have been described (Memoirs Royal Society of South Australia, vol. i., part i.).

It is clear by reference to the bones of other skeletons in the Callabonna collection that the animal now represented was of medium size only, the height of the cast at the shoulder being 5 feet 6 inches, but unfortunately the skeletons of the very large individuals were much more incomplete than that which served as our model. I think it would be safe to place the height of the largest animals in life at 6 feet, or perhaps even a few inches more.

With regard to the restoration in the flesh, the photograph which I send you was made by my friend Mr. C. H. Angas, a skilful delineator of animals, with such help as we could give him from the anatomist's point of view. There can, I think, be little doubt that in its general build the *Diprotodon* had considerable resemblance to a gigantic wombat, and as such we have drawn him. Opinions may, however, differ as to our treatment of the muzzle. The huge overarching nasals, which greatly exaggerate the somewhat similar formation in the tapir, and the very massive bony internarial septum, must indicate some special, and probably some protuberant, development of the soft parts in this region. Bearing in mind the many cranial, as well as other skeletal, resemblances between *Diprotodon* and *Macropus*, we have consequently assigned to the former in our restoration a snout of the same type as that of the latter animal, but of greatly exaggerated size and prominence. In the case of the ears, we have compromised between the extremes of length of those organs as they occur in the kangaroos and wombats, with, however, a nearer approach to the

I might add, though the information has already appeared in your columns, that a copy of this cast is in the possession of the Zoological Museum at Cambridge University, and that portions of it, together with some original bones, have been sent to the Natural History Department of the British Museum. Replicas of it have also been sent to the museums of Melbourne, Victoria, and of Perth, Western Australia.

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The Museum Adelaide, South Australia, August 6.

### The Origin of Radium.

IN a communication published in *NATURE* of November 15, 1906, I described some experiments which had given results indicating the growth of radium in a preparation of thorium which had been previously precipitated in a solution of a uranium mineral. I had found from other experiments that the thorium after this treatment contained a radio-active body which did not decay appreci-

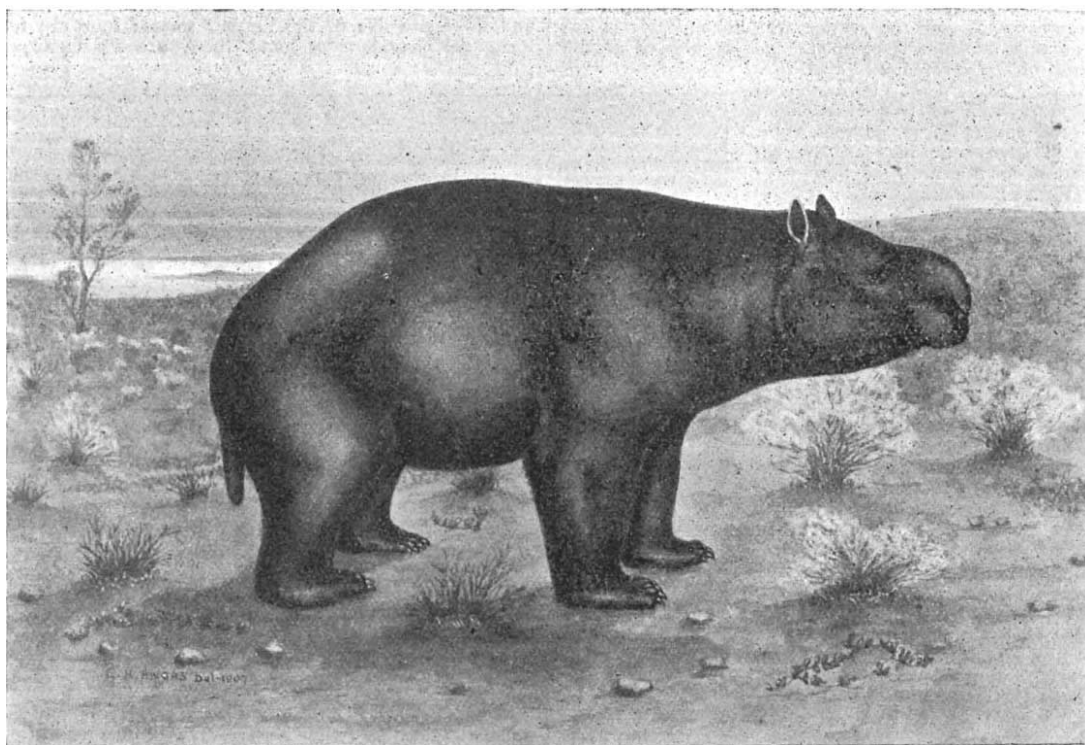


FIG. 2.—Restoration of *Diprotodon australis*.

former proportions. The result, on the whole, has been to make the head appear much more like that of a very massive and bulky kangaroo than of a wombat. In the original sketch we have presumed the animal to be covered with a very dark short fur of wombat type. For a setting we have delineated the *Diprotodon* amidst surroundings that represent some present characteristics of Central Australia. Thus in the background, to the left, is part of the white expanse of one of those large salt-encrusted clay pans of which Lake Callabonna, where the bones were found, is an example. In the distance beyond the lake is shown one of the flat-topped hills that are very characteristic of the "desert sandstone" region of the interior. The vegetation in the foreground is chiefly "saltbush" (*Atriplex* spp.), some species of which, together with allied plants, having apparently formed the principal food of the *Diprotodon*, just as these now supply the chief sustenance of the introduced *Herbivora*, while here and there is a trailing plant of "*parakylia*" (*Claytonia* spp.), so well known to travellers in the dry central regions for its moisture-holding properties.

ably in the course of several years. It was a simple matter to demonstrate that this active substance was not radium, uranium, or polonium, and I therefore assumed that it was actinium, since Debierne has stated (*C.R.*, cxxx., 906) that the chemical properties of actinium are similar to those of thorium, and since, moreover, an emanation which completely lost its activity in less than half a minute was evolved in small amounts from the oxides of the thorium treated in this manner. I therefore suggested that actinium was the parent of radium and the intermediate product between uranium and radium.

Rutherford has recently given an account (*NATURE*, June 6) of some experiments in the course of which a solution of actinium was successively precipitated with ammonium sulphide in order to remove the radium present. From the results obtained he concludes that the parent of radium is distinct from actinium, and is separated from the latter by precipitation with ammonium sulphide.

For the past ten months I have been continuing my